

THE MINERAL INDUSTRY OF

RUSSIA

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Russia, which extends over 11 time zones, is the largest country in land area in the world and occupies more than 75% of the territory of the former Soviet Union (FSU). Accordingly, it possesses a significant percentage of the world's mineral resources. Russia, which was a major mineral producer, accounted for a large percentage of the FSU's production of a range of mineral products, which included aluminum, bauxite, cobalt, coal, diamond, mica, natural gas, nickel, oil, platinum-group metals (PGM), tin, and many other metals, industrial minerals, and mineral fuels.

The mineral industry was of great importance to the Russian economy. Enterprises considered to be part of the mineral/raw material contributed more than 70% of the budget revenues derived from exports (Malyshev, 2000).

The most significant regions of the country for metal mining were East Siberia (cobalt, copper, lead, nickel, columbium, PGM, tungsten, and zinc), the Kola Peninsula (cobalt, copper, nickel, columbium, rare-earth metals, and tantalum), North Caucasus (copper, lead, molybdenum, tungsten, and zinc), the Russian Far East (gold, lead, silver, tin, tungsten, and zinc), and the Urals (bauxite, cobalt, copper, lead, nickel, and zinc (Novikov and Yastrzhembskiy, 1999).

Most Russian crude oil and natural gas production came from large deposits in West Siberia. Coal production was mainly from East Siberia and West Siberia. Raw materials mined for mineral fertilizers were produced primarily on the Kola Peninsula (phosphate raw material) and in the Urals (potash).

Russia possesses one of the world's largest mineral raw material bases. According to assessments of analysts from the Russian Federation Ministry of the Economy's Department of the Economics of Metallurgy, reserves are sufficient at the 1995 to 2000 levels of extraction to supply existing enterprises that mine iron ore for 15 to 20 years and longer and mining nonferrous metals for 10 to 30 years.

A large percentage of Russia's reserves, however, are in remote northern and eastern regions of the country that have severe climates, lack transport, and are far away from major population and industrial centers. Enterprises built during the Soviet era in such areas, which included those mining tin and tungsten, had sharply curtailed operations. Efforts to develop new large deposits of nonferrous metals in such eastern regions as near the Baikal-Amur railroad were not progressing. Metallurgical enterprises in developed regions, such as the Kola Peninsula, the North Caucasus, and the Urals, were operating on rapidly depleting resource bases and had raw material shortages (Yatskevich, 2000).

Russian analysts stated that because mining enterprises were now working under market-economy conditions, the criteria for determining reserves must be reevaluated. Previously, reserves were evaluated under conditions in which the state-set prices resulted in low energy, transport, and equipment costs. This was combined with the state distributing profits among enterprises and making capital investments from the state

budget (Novikov and Sazonov, 2000). According to Russian analysts, if a reevaluation were to occur on the basis of market economy costs of production, then actual reserves would diminish by 30% to 70% for ferrous and nonferrous metal reserves. Such a reassessment, however, would provide the country with a realistic base for knowing which deposits could be economically developed and be competitive on world markets (Novikov and Yastrzhembskiy, 1999; Novikov and Sazonov, 2000).

Mineral consumption in Russia has fallen drastically since the dissolution of the Soviet Union because of the general downturn in economic activity and the sharp fall in defense industry production, which was a major consumer of a range of metals. Low domestic demand coupled with worn out plant and equipment affected the quantity and quality of output (Malyshev, 2000; Yatskevich, 2000). Faced with the downturn in domestic consumption, Russia had become a large exporter of minerals to world markets. It was exporting a large percentage of its production of nonferrous and precious metals and oil and gas. In cases where Russia was still exporting minerals to other FSU countries, it was, at times, incurring heavy debt from nonpayment as was the case with natural gas shipments. Until economic activity in Russia significantly increases, Russia's mineral industries will continue to try to export a major share of their output to world markets.

Lack of funding had caused a deterioration of fixed capital stock at mining enterprises. At the majority of mining enterprises, production indicators decreased sharply. During the stages of mining and processing ore, between 30% and 50% of reserves calculated as being in the ground were being lost. Also, owing to a lack of processing facilities, many ores and concentrates, particularly for lead and zinc, were being exported for processing with the loss of valuable byproduct metals, which included bismuth, cadmium, gold, and silver (Yatskevich, 2000). For the past decade, there had been practically no replacement of mining machinery, and about 80% of mining machinery in operation has been near the end of its operable life and in need of replacement (Malyshev, 2000).

According to a report by the Foreign Investment Promotion Center of the Russian Ministry of the Economy, Russia's economic development was characterized by its raw materials export orientation, excessive import reliance, a high income and consumption differentiation in the population, and low levels of investment and monetization. Russia's existing advantages (highly educated and technically/scientifically trained labor force, relatively low labor costs, rich natural resources, etc.) were not used to the full extent (Foreign Investment Promotion Center of the Ministry of Economy of the Russian Federation, [1999], Russian economy—Probable parameters of socioeconomic development for the year 2000 and the period till 2002, accessed October 4, 1999, at URL <http://www.fipc.ru/fiptest/reviews/2000.html>).

With very few exceptions, Russia's metal mining and

metallurgical sector had significantly reduced production levels compared with those of the Soviet period. According to Russia's Minister of Natural Resources, mine output levels in 1999 in comparison with those of 1990 had decreased by between 20% to 30% for bauxite, cobalt, copper, and iron ore, by 50% for zinc; and by 75% or more for lead, molybdenum, and tin. During this period mining of columbium and tantalum ores ceased. Metal production in 1999 in comparison with 1990 levels had fallen by 22.2% for refined copper, 15.4% for lead including secondary, 27.3% for magnesium and magnesium alloys, 30.2% for nickel, 78.5% for tin, and 43.8% for titanium sponge (Yatskevich, 2000).

Russia's fuel-energy complex (TEK) remained a mainstay of the economy with the TEK's share of industrial production increasing to 26.6% in 1999 from 24% in 1990. Russia was the world's largest exporter of natural gas and the world's second largest exporter of crude oil and products (U.S. Energy Information Administration, February 2000, Russia—Oil, Country Analysis Briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Enterprises of the TEK provided more than 40% of all tax revenues to the national budget. In 1999, the TEK accounted for 42.4% of the total volume of exports (Krasyanskiy and Shchadov, 2000).

Since the breakup of the Soviet Union, mining of fertilizer raw materials had been sharply reduced owing to the decline in demand in domestic agriculture. A large percentage of the fertilizer raw materials that was being mined was exported. In 1999, plans called for delivering 4 million metric tons (Mt) of fertilizer in terms of nutrient content to domestic agriculture, but only 1.2 Mt was actually supplied. In the past decade, the level of fertilizer use in agriculture had fallen by 90%. The low level of agricultural output was attributed, in part, to the decreased use of fertilizers. The rate of nutrient extraction from the soil far exceeded the rate of replenishment. Increasing the rate of extraction and use of mineral fertilizers was considered to be of major importance (Timchenko, 2000).

The large construction materials mining and processing sector comprised more than 5,000 enterprises with capacities that ranged between several thousand and several million cubic meters per year of output. The base of this sector was composed of small and medium-sized enterprises. Practically all material was extracted by open pit mining. The State listed 8,500 deposits with reserves of construction materials. The country planned to develop more small and medium-sized deposits closer to consumers to reduce the scale of capital investment and transport costs (Buyanov, 2000).

By the end of 1998, the financial crisis that began during the summer started to stabilize, and production, which was driven by exports, started to revive (Foreign Investment Promotion Center of the Ministry of Economy of the Russian Federation, [1999], Russian economy—Probable parameters of socioeconomic development for the year 2000 and the period till 2002, accessed October 4, 1999, at URL <http://www.fipc.ru/fipctest/reviews/2000.html>).

In 1999, Russia's GDP and industrial output increased by an estimated 3.2% and 8.1% in constant prices, respectively, in comparison with those of 1998 (Interfax Statistical Report, 2000); in contrast, GDP contracted by 4.9% and industrial output by 5.2% in 1998 in comparison with that of 1997. In 1998, the inflation rate was 84.5% compared with the target rate of 8%, the ruble exchange rate reached 20.65 rubles per \$1 by year end compared with 5.96 rubles per \$1 at the beginning of

the year, and real disposable income dropped by 28% in the fourth quarter of 1998 relative to the same period in 1997 (World Bank Group, September 2000, Russian Federation—Country brief, accessed November 6, 2000, at URL <http://wbln0018.worldbank.org/ECA/eca.nsf/4980307d4e471bd8852567d10014313b/e2e05bddd7ee295f852567ef00789073?OpenDocument>).

The recession of 1998 was initially expected to worsen in 1999. According to a World Bank analysis, however, the large devaluation of the ruble, the rise in oil export prices by an average of 40%, and the insulation from the financial sector crisis provided by barter and other noncash settlements led to a much better recovery than expected. Still, despite a \$30 billion trade surplus in 1999, Central Bank reserves barely grew, evidencing that exporters preferred to keep their assets abroad. The country's financial reserves were \$12.5 billion at yearend 1999; of that, currency reserves were \$8.5 billion, and gold was \$4 billion (World Bank Group, September 2000, Russian Federation—Country brief, accessed November 6, 2000, at URL <http://wbln0018.worldbank.org/ECA/eca.nsf/4980307d4e471bd8852567d10014313b/e2e05bddd7ee295f852567ef00789073?OpenDocument>). Russia's debt-servicing problem remained, and investment activity had not been restored. A restoration of domestic demand, which was still very weak, was considered to be essential for achieving steady economic growth (Foreign Investment Promotion Center of the Ministry of Economy of the Russian Federation, [1999], Russian economy—Probable parameters of socioeconomic development for the year 2000 and the period till 2002, accessed October 4, 1999, at URL <http://www.fipc.ru/fipctest/reviews/2000.html>).

The industrial recovery in 1999 was broad based and affected all sectors of industry. Production increases were reported for practically all mineral commodities. Notably, iron ore and coking coal output increased, economic indicators in enterprises in the gold mining and construction materials sectors improved, and exports of steel products increased (Malyshev, 2000). The Russian nonferrous metals sector, which accounted for 8.4% of the value of the country's total industrial output in 1999, increased output by 8.5% in comparison with that of 1998 (Interfax Mining and Metals Report, 2000g).

Despite the generally positive economic developments, the Government still faced a number of key challenges in building the foundation for sustainable growth. Although the ruble devaluation and rise in oil prices helped the rebound in economic activity in the short-run, the challenge remained to address structural issues that would provide for sustainable economic growth; among the most notable was nonpayment of taxes. Improving the investment climate was a major related challenge that required increasing transparency and addressing corruption and bureaucratic red tape and at the same time, strengthening property rights and contract enforcement (World Bank Group, September 2000, Russian Federation—Country brief, accessed November 6, 2000, at URL <http://wbln0018.worldbank.org/ECA/eca.nsf/4980307d4e471bd8852567d10014313b/e2e05bddd7ee295f852567ef00789073?OpenDocument>).

For a brief period, Russia officially published data on nonferrous metals production but began to reclassify production data in physical units as secret in 1995 and officially published only percentage increases or decreases in production in 1999. Despite the reimposed secrecy, data in physical units for a

number of nonferrous metals have appeared in Russian sources, although not in a systematic manner. Production data for ferrous metals and fuels were being published, which was the practice during the Soviet era, although, again, more-complete data are now available. Data were published consistently only for a few nonmetallic mineral commodities and sporadically and unsystematically for the remaining commodities.

Commodity Review

Aluminum

Reserves.—More than 50% of the explored bauxite reserves are in the North-West economic region, and 28% are in the Ural Mountains. Deposits in the Urals are characterized by complex geologic and hydrological conditions (Novikov and Yastrzhembskiy, 1999). These deposits accounted for more than 80% of Russian bauxite production (Kozlovskiy and Shchadov, 1999).

The highest quality bauxite reserves are in deposits of the North-Urals bauxite mining stock company (Sevuralboksitruda), which controlled 24% of all explored bauxite reserves. These reserves, however, are at great depths and characterized by complex mining and hydrological conditions (Novikov and Sazonov, 2000).

Production Status.—In 1999, Russia ranked second in the world in primary aluminum output; Russian output increased compared with that of 1998 (Plunkert, 2000). In 1999, Russia ranked sixth in the world in alumina production and eighth in the world in bauxite output (U.S. Geological Survey, unpub. data, 2000).

In 1999, Russia increased primary aluminum production by 4.7% to about 3.5 Mt in comparison with 3.0 Mt in 1998. Alumina production increased by 7.8% to 2.66 Mt in comparison with that of 1998 (Interfax Mining and Metals Report, 2000a). Bauxite production in 1999 was 4.77 Mt (Prokopov, 2000). All Russian aluminum smelters increased output in 1999 in comparison with that of 1998. In 1999, Bratsk, which was Russia's largest smelter, produced 870,700 metric tons (t), followed by Krasnoyarsk at 836,500 t, Sayansk at 386,400 t, Siberian-Ural Aluminum Company (SUAL) at 340,600 t, Nonkuznetsk at 273,500 t, Bogoslovsk at 158,800 t, Volgograd at 130,200 t, Kandalaksha at 67,900 t, Nadvoitsy at 64,600 t, and Volkhov at 17,500 t. SUAL was an amalgamation of the Irkutsk and the Uralsk aluminum smelters (Interfax Mining and Metals Report, 2000a).

Russia was dependent on imported raw materials for the majority of its primary aluminum production. Bauxite production was centered in the Urals with 84% of production, the majority of which came from the North Urals bauxite mining region (Kozlovskiy and Shchadov, 1999). About 75% of alumina production was in the European part of the country, and 85% of primary smelting capacity was in East Siberia and West Siberia. The major smelters were located near sources of hydroelectric power, which are 4,000 to 6,000 kilometers (km) from the ports through which imported raw materials arrive.

Russian aluminum production was directly affected by the world aluminum market. Along with fluctuations in the world price of aluminum, instability in raw materials supply, as well as in aluminum sales, were common problems for most Russian aluminum plants, which operated by importing a large

percentage of raw materials and exporting the major portion of their products through short-term tolling contracts concluded between aluminum manufacturers and trade intermediaries (Institute for Stock Market and Management, 1999, Competitiveness of the Russian aluminum industry, accessed October 5, 1999, at URL <http://www.yandex.ru/yandbtm2b=2&...&d=1&text=reserves%20AND%bauxite>). By 1998, the percentage of primary aluminum produced through tolling arrangements was more than 80% of total output (Novikov and Sazonov, 2000).

The dramatic decline in the domestic demand for aluminum products (a sevenfold decrease in 1998 compared with that of 1990) did not affect production at Russian aluminum smelters, which switched almost entirely to producing primary aluminum for export. Russian aluminum plants operated at 100% of their capacity in 1999. Production of rolled products, semifinished products, and finished products, however, had decreased by more than sevenfold compared with that of 1990 because these products were not in demand on the domestic market and the competitiveness of those products on the world market was negatively affected by the limited ability of Russian manufacturers to ensure Western quality standards (Institute for Stock Market and Management, 1999, Competitiveness of the Russian aluminum industry, accessed October 5, 1999, at URL <http://www.yandex.ru/yandbtm2b=2&...&d=1&text=reserves%20AND%bauxite>).

Production Development.—Alumina producers were confronted with economic difficulties because of the low quality of domestic raw materials and rather scarce reserves of bauxite. A program was planned to mine new bauxite reserves at the Sredne Timan deposit in the Komi Republic in the northern European part of country and in Sverdlovsk oblast in the Urals to supply raw material for alumina refineries in the Urals. High production costs at the Sevuralboksitruda company were predicted to result in a 35% to 40% reduction in output. Depletion of the smaller Tikhvin and southern Urals deposits was predicted by 2000 (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999; Yatskevich, 2000).

According to the President of the Russian Aluminum Association, predicted Russian aluminum production would increase in the coming decade—rising to 3.7 Mt by 2005 and 4.3 Mt by 2010. The growth in production was to be achieved by expansion of the Irkutsk, the Sayansk, and the Volkhov aluminum plants and construction of a new aluminum plant in Irkutsk oblast and possibly in Leningrad oblast (Prokopov, 2000).

Along with expanding production, all Russian aluminum smelters were in need of modernization, which would require large investments. These investments were not being made at an adequate scale because the industry was not receiving investment credits from either domestic or foreign sources and was financing modernization almost entirely from enterprise sales (Prokopov, 2000).

A further goal of the industry was to increase the use of secondary aluminum in the domestic economy. In 1999, the country consumed 500,000 t of primary aluminum and between 40,000 and 50,000 t of secondary aluminum (in many developed countries, up to 40% of aluminum consumed is from secondary sources) (Prokopov, 2000).

Antimony

Reserves.—All antimony reserves are in the Yakut-Sakha republic. The only sources of antimony production are gold-antimony quartz vein-type deposits that account for about 50% of the antimony reserves. Two deposits were exploited, the Sarylakh deposit 65 km southwest of the town of Ust-Nera and the Sentachan deposit in the northeastern part of the Yakut-Sakha republic; the metal content of the ore in these deposits can reach as high as 30% and 58%, respectively. These two deposits, which contain almost 200,000 t of reserves, accounted for 84% of total Russian reserves. The Sarylakh deposit reserves were estimated to be about 90,000 t with an additional 20,000 t of subeconomic resources. The Sentichan deposit had about 95,000 t of reserves and 12,000 t of subeconomic resources. The only other deposit that was considered to be of potential commercial value was the Udereyskoye with antimony reserves of 38,000 t with the antimony content of ore at a grade 9.9% (Russian Mining, 2000a).

Production Status.—Output had fallen to a little less than 2,000 t of metal in concentrate in 1999 from about 6,000 t of metal in concentrate in 1991. In 1999, however, Russia still ranked fourth in the world in mine output of antimony (U.S. Geological Survey, unpub. data, 2000). Although deposits in the Yakut-Sakha republic accounted for the majority of antimony mined in the FSU, the majority of metallurgical processing took place at the Kadamzhay antimony plant in Kyrgyzstan; some metallurgical processing took place at the Ryaztsvetmet plant in Ryazan (Russian Mining, 2000a).

The Sarylakh Mine had a design capacity to produce 100,000 metric tons per year (t/yr) of ore, although its actual capacity was about 60,000 t/yr. Reserves at Sarylakh were considered to be adequate for about 10 years of operation. Reserves at the Sentachan deposit were considered to be adequate for about 30 years of operation. Mining at Sentichan initially had been open pit but was switched to underground mining (Russian Mining, 2000a).

Production Development.—Moving to the production of more value added metallurgical products from that of concentrates was the intention of the industry. A contract concluded with the Borex Corporation of the United States for exporting concentrate in 2000 was expected to improve the financial outlook at the Sarylakh Mine (Russian Mining, 2000a).

Coal

Reserves.—According to Russian assessments, Russia ranked third in the world in coal reserves after the United States and China (Malyshev, 2000). On the basis of the Soviet reserve classification system, which was still being used in Russia, Russian experts reported that 70% of proven coal reserves, which totaled 140.2 billion metric tons (Gt), were termed economic reserves. Of these economic reserves, 90% is in the Asiatic part of the country, and 40% of the demand for coal comes from the European part (Kozlovskiy and Shchadov, 1999). Russia's two largest coal basins are the Kansk-Achinsk lignite basin in East Siberia with 79 Gt of explored reserves and the Kuznetsk basin, which contained steam and coking coal in West Siberia, with 68 Gt. The remaining reserves are in basins with 10 Gt less of explored reserves located in various regions

throughout the country (U.S. Central Intelligence Agency, 1985, p. 34-35; Gornaya Entsiklopediya, 1991, p. 233).

Production Status.—In 1999, Russia ranked fifth in the world in coal production after China, the United States India, and Australia (Krasnyaskiy and Shchadov, 2000). Coal production and consumption had fallen by approximately one-third since the breakup of the Soviet Union. By 1998, coal accounted for less than 20% of the country's domestic energy supply (U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

In 1999, of the 220 coal mines in operation, 106 were open pit, and 114, underground. About 80% of coal extraction was conducted by "stock companies" in which the Government owned less than 50% of the shares. Total coal mining capacity in 1999 was about 261 Mt, of which 163 Mt was open pit mine capacity and 97 Mt, underground mine capacity (Krasnyaskiy and Shchadov, 2000).

In 1999, the country produced almost 250 Mt of bituminous coal and lignite, of which 42.7% was produced from the Kuzbas; 14.6%, from the Kansk Achinsk basin; 13.5% from East Siberia; and 11.9%, from the Russian Far East. The largest volume of coal was mined in Kemerovo oblast (about 107 Mt), followed by Krasnoyarsk kray (36 Mt), Irkutsk oblast (15 Mt), and Chita oblast (12 Mt).

Production Development.—Plans called for restructuring the coal industry to close 149 unprofitable enterprises that produced 38 Mt by 2002. The money saved was to be used to upgrade profitable mines. Plans called for increasing the percentage of coal consumed in the country's energy balance (U.S. Energy Information Administration, October 1998, Russia—Country analysis briefs, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Factors that impeded the growth in exports to world markets included high transport costs and loss of coal quality during transport. Russian coals at their point of origin were considered to be of suitable quality for world markets. If the Russians could resolve problems regarding loss of quality during shipment, then demand for Russian coal could increase in the European Union owing to a projected decrease in this region's coal mining output. With the enhancement and modernization of port facilities on the Baltic and the Black Seas, Russian coal exports had the potential to double. Foreign capital, however, would be required to modernize coal mines to make them cost-competitive producers for world markets (X.M. Prevost, South African Minerals Bureau, unpub. data, 1999).

Copper

Reserves.—Russia possesses about 10% of the world's copper reserves (International Copper Study Group, 1998). The majority of reserves are in copper-nickel sulfide and pyrite ores. More than 50% of reserves are in deposits already under development. Ore grades were reportedly competitive with other producing deposits in the world (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). Approximately 70% of the country's reserves are in East Siberia; 20%, in the Urals; and 10%, in the North Caucasus (Haeusser and others, 1994, p. 9).

Production Status.—In 1999, production of copper in concentrate increased by 13.4%, and that of refined copper, by 20.6% in comparison with that of 1998 (Interfax Mining and Metals Report, 2000g). The copper content of ore in Russian deposits under development averages 1.6% (Piven', Konovalov, and Shtern, 1999). From 65% to 70% of ore mined was from copper-nickel sulfide deposits, and the remainder, from pyrite ores. The Norilsk complex in East Siberia, which was the country's major copper mining enterprise, was mining ore with an average copper content of about 5%. In 1999, Russia ranked seventh in the world in mine output of copper (Edelstein, 2000). Approximately 70% of the country's copper production was from the Norilsk mining and metallurgical complex, and the remainder, from mining and metallurgical enterprises in the Urals (Interfax Mining and Metals Report, 2000c). Tolling accounted for about 6% of the country's refined copper output (International Copper Study Group, 1998). At Norilsk, the Oktyabrskiy underground mine was producing almost 70% of Norilsk's copper mine output. Almost all the remaining mine output of copper at Norilsk came from the Komsomolskiy and the Taymirskiy underground mines (Piven', Konovalov, and Shtern, 1999).

Production Development.—Foreign investment was needed for adequate development of Russia's copper reserves (International Copper Study Group, 1998). Growth in reserves in the near term would be in areas contiguous to existing reserves and beneath existing reserves. Underground mines were being developed beneath the Molodezhnyy, the Sibay, and the Uchali open pits in the Urals because of the depletion of reserves suitable for open pit development. Also in the Urals, copper mines were being developed at the Aleksandrinskoye deposit, which was part of the Mednogorsk complex, the Letnyeye deposit which would supply the Gai complex, and the Safyanovskoye deposit, which is at the Rezh nickel plant (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). At the Norilsk complex, the Oktyabrskiy Mine planned to mine a greater quantity of cuprous ore and a lesser amount of rich ores with a high nickel content, which were being depleted. Plans called for increasing cuprous ore production at Oktyabrskiy from 100,000 t/yr in 1999 to 1.6 million metric tons per year (Mt/yr) in 2002. During this same period, production of rich copper-nickel ores was to decrease from 4 Mt/yr to 3.4 Mt/yr (Piven', Konovalov, and Shtern, 1999). The cuprous ores at Norilsk are more than 40% higher in copper content than the nickel-rich ores (Natural Resources Canada, unpub. data, 1999).

Diamond

Reserves.—In Russia, diamond deposits were in three regions—Arkhangelsk oblast, Perm oblast, and the Yakut-Sakha republic. On the basis of the Soviet reserve classification system, which was still being used in Russia, 81.6% of total reserves was in reserve categories A, B, and C1. Almost 100% of production came from kimberlite deposits near Mirnyy in the Yakut-Sakha republic. The quality of reserves is decreasing, and new rich deposits of high-quality diamond need to be developed (Vaganov, Golybev, and Bogatykh, 1999). The most significant area for new development was the Lomonosov diamond deposit in Arkhangelsk oblast, which is 100 miles north of the city of Arkhangelsk. The deposits consisted of six

kimberlite pipes (the Arkhangelskaya, the In Honor of (imeni) Karpinskiy-1, the In Honor of Karpinskiy-2, the In Honor of Lomonosov, the Pionerskaya, and the Pomorskaya). Resources at all but the Pomorskaya pipe were classified as reserves (Shtyrov, 2000).

Production Status.—In 1999, Russia was estimated to be the world's third largest producer of gem and industrial diamond (U.S. Geological Survey, unpub. data). Russia accounted for 21% of world mine output of diamonds. Following a decrease in production between 1990 and 1992, diamond production had been increasing at a rate of between 2.5% and 3.5% per year (Shtyrov, 2000).

Practically all Russian diamonds were mined by the Almazy Rossii-Sakha Association (Alrosa) in the Yakut-Sakha republic. At Alrosa, the main production unit was the Udachny mining and processing complex, which developed the Udachny and the Zarnitsa diamond deposits and produced more than 80% of Alrosa's diamond. Other units were the Mirnyy mining and processing complex, which developed the International and the Mir diamond deposits and produced high-quality diamonds; the Aikhalskiy mining and processing complex, which developed the Aikhal and the Jubilee diamond deposits; and the Anabar placer mine developed the Anabar placer (Interfax Mining and Metals Report, 1999a).

Since 1992, growth in reserves has not compensated for the amount of diamonds extracted. In accordance with a contract, almost all rough diamonds were exported through De Beers Central Selling Organization (CSO). About 50 Russian companies were engaged in cutting and polishing diamonds, and 80% of Russia's diamond cutting and polishing operations was at plants in Moscow and Smolensk (Basel Magazine, 1999; Vaganov, Golybev, and Bogatykh, 1999).

Production Development.—Plans for diamond development in the Yakut-Sakha republic for the next 5- to 10-year period called for switching to underground mining at a number of deposits; constructing open pit mines, as well as roads and other infrastructure, at the Zarnitsa and Komsomolskiy deposits; constructing mining enterprises to develop the Botubinsk and the Nyurbinsk pipes; and developing cutting and jewelrymaking capacities (Shtyrov, 2000).

In 1999, the first stage of an underground mine was put into operation at the International deposit, and ore extraction began at the Zarnitsa pipe. The International deposit had been open pit mined for 8 years until 1981 and then decommissioned once the quarry reached a depth of 286 meters. Construction of the underground mine at the International deposit started in 1976. Construction work, however, was halted owing to financial and technological difficulties (Interfax Mining and Metals Report, 1999a).

A subsidiary company of Alrosa began mining diamonds at the Nakynsk ore field, which was in a new perspective region in the western part of the Yakut-Sakha republic. At Nakynsk, the Botubinsk and the Nyurbinsk, pipes were being developed. Extraction began at the Nadezhda Mine, which had been built as an exploratory mine at the Botubinsk pipe (Shtyrov, 2000). Besides developing resources in the Yakut-Sakha republic, Alrosa was participating in diamond development in Angola.

In 1998, the Russian company Soglasiya entered into the Severalmaz joint venture with De Beers to develop the Lomonosov field in the Arkhangelsk region. The field

reportedly contains diamonds, of which 50% is of gem or near gem quality (Summary of World Broadcasts, 1998). Also, a projected world deficit in industrial diamonds could provide justification for developing the Popigayskoye industrial diamond deposit in the northeastern part of country (Vaganov, Golybev, and Bogatykh, 1999; Vagonov and Simonov, 1999). High priority was to be given to developing domestic diamond cutting and polishing capacity, and a way was being sought to supply the Russian plants in accordance with the agreement with the CSO (Basel Magazine, 1999; Vaganov, Golybev, and Bogatykh, 1999).

During the next 5 years, the Aikhal complex at Alrosa will replace the Udachny complex as the main diamond producer owing to the commissioning of the Jubilee deposit, which had been under development since 1997. Plans also called for Aikhal to develop the new Komsomolskiy pipe and underground mining at the Aikhal pipe (Kalitin, 2000). In addition, the Nyurbinsk deposit was to be brought on-line in 2 to 3 years. In the future, Alrosa planned to produce the main volume of its high-quality jewelry-grade diamonds at the International deposit. At this deposit, the quality of the stones is similar to those at the Mir deposit, which was Alrosa's main source of large quality gemstones.

Gold

Reserves.—According to Russian assessments, Russia ranked third in the world in gold reserves after South Africa and the United States (Malyshev, 2000). The majority of production was from placer deposits in the eastern part of country, but lode deposits were increasing in importance. In 1995, the Russian Committee on Geology and Use of Subsurface Resources identified 4,569 potential gold deposits in 39 regions of the country, of which 94% were placer deposits. Only 20% of the gold contained in these resources, however, was in placers. More than 65% of the resources is located in Eastern Siberia and the Russian Far East. Hard-rock ores averaged about 4 grams per metric ton (g/t) gold; placer gravels, about 0.9 gram per cubic meter; and placers for alluvial dredging, about 369 milligrams per cubic meter. The main placer resources were located in the Amur, the Chita, the Chukotka, the Irkutsk, the Khabarovsk, the Magadan, and the Sakha-Yakutia regions. The leading regions for lode gold deposits were Chita, Chukotka, Irkutsk, Kamchatka, Khabarovsk, and Magadan in the eastern part of the country; Krasnoyarsk in East Siberia; and Sverdlovsk in the Urals (Mining Week, 1998).

Production Status.—According to the Union of Russian Gold Producers, gold production increased by about 10% in 1999 compared with that of 1998 (Interfax Mining and Metals Report, 2000d). Of the 566 gold mining enterprises in operation, whose output ranged from several kilograms to more than 1 t/yr, 389 enterprises produced less than 100 kilograms per year (kg/yr); 99 enterprises, produced between 100 kg/yr and 300 kg/yr; and 62 enterprises more than 300 kg/yr, 16 enterprises, producing more than 1 t/yr. Only nine enterprises were state owned; the rest were privately owned or publically owned stock companies. The Government, however, maintained an ownership share in 25 of the stock companies. In 1999, Government-owned firms produced 415 kilograms of gold; this was less than 0.5% of the national output. The stock

companies in which the Government was a part owner mined 5.5 t in 1999. Six regions in the eastern part of the country (Chukotka, Irkutsk oblast, Khabarovsk kray, Krasnoyarsk kray, Magadan oblast, and the Sakha-Yakutia republic) produced more than 75% of the country's output. The gold mining sector employed 80,000 persons; the productivity of labor was calculated to be 1.7 kg/yr of gold per person in comparison with 1.2 kg/yr per person in 1992 (Kolmogorov, 2000).

In 1999, Russia ranked sixth in world gold output (Amey, 2000). Production has fallen by about 40% in the past 10 years. One reason that was given by the head of the Russian Department for Precious Metals and Precious Stones within the Ministry of the Economy was that the privatization process that followed the breakup of the Soviet Union resulted in the creation of a great number of small gold mining enterprises, many of which, it was claimed, lacked the means to operate profitably (Kolmogorov, 2000).

Production Development.—At recent production levels, Russia was estimated to possess probable resources to sustain gold mining for about 50 years. Production, however, was mainly from placer deposits for which the resource base is being depleted. To maintain production levels, lode deposits will have to be developed, which will require major new investments in mines and processing plants. Such investment in lode deposits could enable Russia to more than double its 1998 output level (Mining Week, 1998).

Iron and Steel

Production Status.—In 1999, Russia ranked fourth in the world in crude steel production (U.S. Geological Survey, unpub. data, 1999). Following the economic crisis in August 1998, when demand for steel products in Asian markets sharply decreased, Russia began exporting larger volumes of steel products to the United States and other countries, which resulted in the imposition of trade restrictions by these countries (Interfax Mining and Metals Report, 1999b, e). Russia's total steel output was produced in oxygen converter furnaces (60%) or electric furnaces (13%). Compared with that of 1998, crude steel output increased at most of Russia's largest steel mills in 1999—the Kuznetsk complex in Novokuznetsk, by 49%; the Magnitogorsk Metallurgical Complex in the Chelyabinsk region, by 14.2%; the Mechel steelworks in Chelyabinsk, by 10.3%; the Nizhniy Tagil Metallurgical Complex, by 54.8%; the Nosta steelworks in Novotroitsk in the Orenburg region, by 4.9%; the Novolipetsk Metallurgical Complex, by 14.2%; the Oskol Electrometallurgical Combine in Stary Oskol by 17.6%; the Severstal mill in Cherepovets, by 8.2%; and the West Siberian Metallurgical Complex in Novokuznetsk, by 38.2% (Interfax Mining and Metals Report, 2000e).

Iron Ore

Reserves.—According to Russia's Minister of Natural Resources, Russia had more than 27% of the world's reserves of iron ore (Yatskevich, 2000). In 1999, 26 iron ore deposits were under development with reserves adequate for 15 to 20 years at the 1999 rate of extraction. These reserves, however, averaged about 35% iron, which was low by world standards. The ratio of overburden to ore was four times greater on average than in other countries, which greatly increased the comparative cost of

iron ore extraction. Large quantities of what are termed in the Russian reserve classification system “explored reserves” occur in the Kursk Magnetic Anomaly (KMA), which are potential sources of new development (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). Reportedly, explored reserves in the KMA in categories A, B, C1, and C2 totaled 47 Gt, of which 29 Gt was considered to be rich ores (Gornaya Entsiklopediya, 1989, p. 357).

Production Status.—In 1999, Russia increased production of iron ore by 13.1% and pellets by 9.7% compared with 1998 production levels (Interfax Mining and Metals Report, 2000b). Increased output was, in part, in response to increased demand in the machine manufacturing sector, which was a major steel-consuming sector, as well as in the construction sector (Mining Journal, 2000).

From 1990 to 1999, the iron ore mining industry did not suffer as serious a decline as some of the other metal mining industries. In 1999, iron ore output was at 77% of the 1990 level; concentrate production, at 83%, and pellet production, at 91.6%. The volume of output during this period was adequate to meet demand on domestic and world markets. A stable level of exports of between 11 and 13 Mt/yr was established. Imports were sharply curtailed to 3.5 from 16 Mt/yr. In 1999, growth in domestic demand grew among consumers able to pay (Sukhoruchenkov, 2000).

Although the iron ore mining industry had an overall ability to avert a serious decline in production between 1990 and 1999, discrepancies within the industry in the ability of mining enterprises in different regions of the country to maintain production levels were great. Although iron ore mining enterprises in the Central economic region, which included the KMA, were able to maintain and surpass 1990 production levels, enterprises in the Urals were able to achieve only 65% of the 1990 level, and enterprises in Siberia, only 59%. In conjunction with this, iron ore shortages began to appear on regional levels, particularly in Siberia (Sukhoruchenkov, 2000).

In the Central and the North West economic regions, enterprises were able to maintain capacity, and certain enterprises (the Lebedinskiy and the Stoylenskiy in the KMA), to increase capacity. In the Urals and Siberia, however, the decrease in enterprise capacity was significant (Sukhoruchenkov, 2000).

In 1999, Russia ranked fourth in the world in mine output of iron ore (U.S. Geological Survey, unpub. data, 1999). More than 63% of iron ore extraction capacity and 77% of reserves were in developed deposits in the Central and the North West economic regions, which contained 32% of the country’s ferrous metallurgical capacity. Although 68% of the country’s metallurgical capacity was in Siberia and the Urals, only 33% of iron ore extraction capacity and 23% of reserves were in these regions (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

More than 50% of the country’s iron ore was mined from the KMA where three major open pit mining and beneficiation complexes (the Lebedi, the Mikhaylovka, and the Stoilo) were operating (Mining Journal, 2000).

Production Development.—In the near future, regions of Siberia and the Urals may be without their own iron ore base because many of the existing mining enterprises lack adequate reserves. Long-distance rail transport of iron ore from other

parts of Russia and Kazakhstan to metallurgical enterprises has increased the price of iron ore by 15% to 30%. New development of iron ore deposits has been hampered by increasing costs for energy and transport and a lack of economic reserves in areas close to metallurgical centers. The comparatively low grade of ore and the high ratio of overburden to ore pose serious problems for the competitiveness of the Russian iron ore industry (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

Natural Gas

Reserves.—Russian experts claimed that Russia had the world’s largest natural gas reserves with 33% of the world total (Kozlovskiy and Shchadov, 1999; Malyshev, 2000). The U.S. Department of Energy reports Russia’s gas reserves to be more than 48 trillion cubic meters (U.S. Energy Information Administration, October 1998, Russia—Country analysis briefs, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Most production came from reserves in the Arctic regions of West Siberia, with six fields in Tyumen oblast (the Urengoi, the Yamburg, the Zapolyarnoye, the Medvezhye, the Kharasavey, and the Bovanenko) combined having more than three-fourths of the gas reserves in West Siberia. Gasfields in the Orenburg region in the Urals and in the Komi Republic in the European north of the country were significant producers (U.S. Central Intelligence Agency, 1985, p. 15).

Production Status.—As of 1999, Russia was the world’s largest producer of natural gas (U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Russia’s natural gas production had been maintained at near the 1991 level. Three fields (the Urengoi and the Yamburg in West Siberia and the Orenburg in the Urals), accounted for 80% of the country’s natural gas production (U.S. Department of Energy, October 1998, Russia—Country analysis briefs, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Natural gas production was largely under the control of the Gazprom company, which was 38% owned by the Russian Government (U.S. Energy Information Administration, February 2000, Russia—Natural Gas, Country Analysis Briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Gazprom controlled more than 95% of Russia’s gas production, as well as its gas pipeline grid, and was a major factor in the Russian economy. In 1999, Gazprom was Russia’s largest hard-currency-earning entity. Gazprom’s tax payments accounted for 25% of the Federal Government’s tax revenues, but Gazprom had been unable to make full tax payments because only between 15% and 20% of its domestic customers paid promptly or in cash. Therefore, Gazprom was increasing exports to earn hard currency; its natural gas exports outside the FSU increased by 5% in 1999. Increased exports went mainly to western Europe, and exports to Turkey increased by 33% and where exports would increase further as operations were scheduled to commence on the Blue Stream gas pipeline that would supply Turkey in 2001 (U.S. Department of Energy, 1998, Russia—Country analysis briefs, October, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Production Development.—According to the assessment of some Russian analysts, gas production reached its maximum level at producing deposits at the beginning of the 1990's and had entered a period of slow decline. This was of critical importance because gas provided fuel for more than 60% of the electric power generated in the country. In the face of declining gas production, the domestic energy supply and economic recovery could be affected because the country is obligated to export large amounts of gas under long-term contracts and also finds it necessary to increase gas exports to pay taxes and to fund gas production operations (Krasnyaskiy and Shchadov, 2000).

Nickel

Reserves.—According to Russia's Minister of Natural Resources, Russia had 36% of the world's nickel reserves (Yatskevich, 2000). The Norilsk region had 77.5% of the country's nickel reserves, which are in mixed sulfide ores (Kozlovskiy and Shchadov, 1999). Remaining reserves are in mixed sulfide ores on the Kola Peninsula and laterite ores in the Urals.

Production Status.—In 1999, the almost 5% increase in output of nickel products enabled Russia to remain as the world's largest nickel producer (Kuck, 2000). The country's major producer was the Norilsk Nickel enterprise, which mined deposits at Norilsk and on the Kola Peninsula and had metallurgical facilities at these locations. In 1997 PGM production facility in the city of Krasnoyarsk in East Siberia had been sold to the administration of the Krasnoyarsk kray.

Approximately 85% of Norilsk's nickel reserves were in East Siberia, and the remaining reserves were on the Kola Peninsula (Tsvetnye Metally, 1996); the remaining nickel production was from enterprises in the Urals. In 1999, Norilsk Nickel reportedly increased production of nickel by more than 1% compared with that of 1998, although it was not specified at what stage of the production cycle the company was registering this increase; that is, if this was of mine output of nickel, nickel in concentrate, refined nickel, nickel at some other stage of processing, or a mixture of nickel products (Interfax Mining and Metals Report, 2000c).

At Norilsk, the Oktyabrskiy underground mine was producing about 55% of Norilsk's nickel mine output in East Siberia. Almost all the remaining mine output of nickel at Norilsk comes from two other underground mines, the Komsomolskiy, which produced about 25% of the remaining output, and the Taymirskiy, about 15% (Piven', Konovalov, and Shtern, 1999).

Production Development.—Nickel production had fallen by almost 40% from peak levels of the late 1980's. Problems existed with maintaining adequate reserves. The majority of reserves are in areas adjacent to existing producing deposits or at depths below existing reserves. In coming decades, reserves could be depleted unless new deposits were discovered (Kozlovskiy and Shchadov, 1999). At the Oktyabrskiy Mine, nickel-rich ores were being depleted. Plans called for production of nickel-rich ores to decrease from 4 Mt/yr in 1999 to 3.4 Mt/yr in 2002, and the production of cuprous ores at Oktyabrskiy was to increase from 100,000 t/yr to 1.6 Mt/yr during this same period (Piven', Konovalov, and Shtern, 1999). The nickel-rich ores have almost five times as much nickel as

do the cuprous ores (Natural Resources Canada, unpub. data, 1999).

Norilsk Nickel was planning to maintain production levels for nickel through the development of two new mines, the Skalistyy and the Glubokiyy, which was in the planning stage. At Skalistyy, operations began in 1997, and the mine was projected to produce at its capacity output of 2 Mt/yr of ore in late 2001 or in 2002. The Skalistyy Mine was developed as a deeper extension of the Oktyabrskiy Mine, and its ores were said to be equal to those of Oktyabrskiy in nickel content. At the Glubokiyy, development had not begun and would require about 5 years to be put into operation. Its ores were reportedly similar in nickel content to those of the Skalistyy Mine (Piven and others, 1996; Sinitsin, 1997, p. 29; Fleming UCB Research, 2000).

Petroleum

Reserves.—According to Russian assessments, Russia ranked second in the world in petroleum reserves after Saudi Arabia (Malyshev, 2000). Proven oil reserves were reported to be about 6.8 Gt (U.S. Energy Information Administration, October 1998, Russia—Country analysis briefs, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Russian experts reported that approximately 70% of reserves were in large deposits considered to be favorable for development (Kozlovskiy and Shchadov, 1999). Russia's major reserves are in the West Siberian basin, which was the country's major production region. Prior to the development of West Siberia, the Volga-Urals region was the center of Soviet oil production and was still a major producing area. Offshore basins in the Barents and the Kara Seas were considered to be promising areas for further development (U.S. Central Intelligence Agency, 1985, p. 14).

Production Status.—During the 1980's, the Soviet Union was the world's largest oil producer; the Russian republic produced more than 90% of the country total. By 1999, Russia was still the world's third largest oil producer (U.S. Energy Information Administration, January 3, 2000, International energy review, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/iea/contents.html>).

Production in 1999 was only slightly more than one-half of that of 1989. The fall in oil production was attributed to economic factors following the collapse of Soviet Union rather than problems with the raw material base (Kozlovskiy and Shchadov, 1999). Despite the increase in world oil prices, the industry was not able to keep much of the extra revenue it earned from exports because of an increase in oil export tariffs (U.S. Energy Information Administration, January 3, 2000, International energy review, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/iea/contents.html>).

In 1999, Russia was the world's second largest petroleum exporter, but exports were somewhat below the record level of 1998. Almost all exports went to countries outside the FSU (U.S. Energy Information Administration, January 3, 2000, International energy review, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/iea/contents.html>).

Russian oil refineries were operating at only about 50% of capacity owing to the decrease in domestic demand. The refineries were in need of modernization to upgrade their product mix from heavier products that composed of mainly

mazut to lighter fuel products (U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Production Development.—By 2010, plans called for increasing oil production to between 370 and 400 Mt. A lack of capital investment and a decrease in drilling have made it difficult to increase production (Kozlovskiy and Shchadov, 1999; U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). A dispute between Tyumen oil company and BP Amoco concerning the right to control Sidanko, which was Russia's sixth largest oil producer, following bankruptcy of Tyumen, reportedly undermined the confidence of foreign investors (U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Russia could experience difficulty in increasing oil exports because for some companies their traditional export routes through Black Sea ports have been running at full capacity, which left the Baltic ports and the Druzhba pipeline through Ukraine as alternatives. To expand export capacity, plans called for constructing new pipelines and export terminals; these included the proposed Baltic export pipeline, which would be the largest new pipeline outside of the Caspian region, and would involve the construction of three new ports on Russia's Baltic coast (U.S. Energy Information Administration, February 2000, Russia—Country analysis briefs, accessed November 15, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Phosphate Rock

Reserves.—The more than 3.2 Gt of reserves of apatite ore on the Kola Peninsula average about 14% P₂O₅ (Gabrilelyants and others, 1991, p. 69; Gornaya Entsiklopediya, 1984, p. 135). Phosphate rock was also produced at a number of sedimentary deposits that contain lower grade phosphate rock; more than 250 small phosphate rock deposits were deemed to be potentially useful for producing phosphate flour for local agricultural use (Timchenko, 2000).

Production Status.—In 1999, Russia produced 9.1 Mt of apatite concentrate with an average P₂O₅ content of 39% (Timchenko, 2000). Russia ranked fourth in world in phosphate rock production (Jasinski, 2000). In the Khibiny massive, the Kukisvumchorr, the Yukspor, the Apatitovy, the Tsirk, the Koashva, the N'yurkpakh, and the Plato Rasvumchorr ore deposits were under development by the Khibiny mining and beneficiation complex on the Kola Peninsula. In 1999, mining at Khibiny was conducted at two open pit and two underground mines (Fedorov, 2000). The Khibiny complex was the country's major source of phosphate raw material with production of about 8.3 Mt in 1999. Apatite was also mined with iron ore at the Kovdor deposit on the Kola Peninsula and from the Kingisepp mining and beneficiation complex in Leningrad oblast.

The enterprises that were developing the Bryansk and the Verkhnekamsk sedimentary ore deposits had the capacity to produce phosphate that rock yielded about 700,000 t/yr of P₂O₅ and was used in the production of phosphate flour. In addition,

phosphate rock production from the Vyatsko-Kamskoye deposit was used in the production of yellow phosphorous. Owing to the inability of domestic farmers to pay for fertilizer, the production of phosphate fertilizer materials from nonapatite sources has been sharply curtailed (Timchenko, 2000).

The Kola Peninsula produced more than 90% of the country's phosphate output. Production from Khibiny yielded a high-grade apatite concentrate that averaged more than 35% P₂O₅. The Kovdor complex had the potential capacity to produce about 1.5 Mt/yr of apatite concentrate that averaged about 38% P₂O₅ (Timchenko, 2000).

All phosphate raw material exports from Russia were apatite concentrate from the Kola Peninsula; exports were in the range of one-third of total apatite concentrate production (Louis, 1998, p. 35).

Production Development.—The Kola Peninsula will remain the main source of phosphate raw material production, although mining conditions were worsening. The ore quality was decreasing, and mining had to be at deeper levels. Although 60% of production was from open pits in 1997, underground mining would become predominant because 80% of enterprise reserves on Kola required underground extraction. Plans called for maintaining the apatite concentrate production range from 9 to 9.5 Mt/yr, which would require attracting investment to maintain existing production capacities and to prepare new horizons for underground mining (Fedorov, 2000; Timchenko, 2000). Proposals for future development called for developing new deposits on Kola; these would include the Beloziminskoye apatite-rare earths and the Seligdarskoye apatite deposits and developing low-grade phosphate rock deposits in the European part of the country (Kozlovskiy and Shchadov, 1999).

Platinum-Group Metals

Reserves.—According to Russia's Minister of Natural Resources, Russia has more than 40% of the world's PGM reserves (Yatskevich, 2000). Almost all reserves are in mixed sulfide ores at the Norilsk complex (Tsvetnye Metally, 1996). Some platinum reserves in placer deposits were being mined in other areas of the country.

Production Status.—In 1999, Russia was the world's second largest producer of PGM after South Africa (U.S. Geological Survey, unpub. data). The ratio of palladium to platinum was higher in Russian ores than in South African ores. In 1999, the Norilsk complex, which mined more than 95% of the country's PGM, reported that physical output of precious metals, a large percentage of which would be PGM, had increased by 19% compared with that of 1997 (Khloponin, 2000). Also, in 1999, about 11 t of platinum was mined from placer deposits by small private production companies called artels (Interfax Mining and Metals Report, 2000f). The Oktyabrskiy Mine at the Norilsk complex, which was the largest producer of PGM, accounted for almost 60% of the country's PGM extraction. At Norilsk, the Komsomolskiy underground mine, which was the country's next largest producer, accounted for more than 15% of PGM production; the Taymirskiy underground mine, more than 10%; and the Zapolyarniy underground mine, more than 7% (Piven', Konovalov, and Shtern, 1999).

Production Development.—Production depended on adequate reserves at the Norilsk complex where PGM was a byproduct of nickel-copper mining. Despite an expected decrease in the mining of nickel-rich ores at the Oktyabrskiy mine, mine output of PGM was projected to increase. Although plans called for production of nickel-rich ores at Oktyabrskiy to decrease from 4 Mt/yr in 1999 to 3.4 Mt/yr in 2002, the production of cuprous ores at Oktyabrskiy was to increase from 100,000 t/yr to 1.6 Mt/yr during this same period (Piven, Kononov, and Shtern, 1999). The nickel-rich ores have almost as much PGM as do the cuprous ores (9.8 g/t versus 10.8) (Bond and Levine, 2001). The increase in cuprous ore production would increase PGM production levels, and a further increase in PGM production would be derived from increasing production of disseminated ores at the Medvezhiy Ruchey and the Zapolyarnyy mines. These disseminated ores, which are lower in copper and nickel content than other ore types at Norilsk, have a PGM content (9 g/t) almost equal to that of the cuprous and nickel-rich ores (Bond and Levine, 2001). In addition, plans called for the development of two new mines, the Glubokiy and the Skalistyy with nickel-rich ores that have a high PGM content. The Skalistyy Mine began operations in 1997 and was expected to reach capacity production of 2 Mt/yr by late 2001 or 2002. At the Glubokiy Mine, development had not begun and will take approximately 5 years thereafter to commence production (Piven, Yefimov, Karginov, Abramov, Baksheyev, Arshavskiy, and Karagodov, 1996; Sinitsin, 1997, p. 29; Fleming UCB Research, 2000).

Potash

Reserves.—Russian reserves were reported to be about 1.8 bt K_2O (Searls, 2000). All potash production was from the Verkhne Kamsk deposit in the Urals, which contained about 96% of the country's reserves (Timchenko, 2000). Verkhne Kamsk sylvinite ore is hosted by a large halite zone with carnallite zones and sylvinite zones (Troitsky, Petrov, and Grishaev, 1999, p. 101).

Production Status.—Russian potash production has been increasing rapidly during the past 4 years. In 1999, Russia was estimated to have produced more than 4 Mt of potash in terms of K_2O equivalent; in 1996, only 2.6 Mt was produced. The country was estimated to have the production capacity potential to produce 6.3 Mt of K_2O (Russian Mining, 2000b). In 1999, Russia was estimated to be the world's second largest potash producer (U.S. Geological Survey, unpub. data, 1999). All production came from two enterprises, the Silvinit and the Uralkaliy, which mined the Verkhne Kamsk deposit.

Production Development.—Growth in production was based on growth of exports because domestic demand remained quite low. The goal of increasing exports was being facilitated by improvements at Latvia's Baltic Seaport facilities at Riga and Ventspil and at the Black Sea facilities at Illichiv'sk in Ukraine, which were the major shipping ports for Russian potash (Louis, 1998).

Because of increased exports to China, India, and Japan, putting the Nepskoye potash deposit in Siberia into operation was a necessity. Owing to lower transport costs for deliveries to Asian markets, potash exports from Nepskoye would be twice as profitable as those from existing operations (Russian Mining,

2000b).

Tin

Reserves.—According to Russian assessments, Russia ranked either first or third in the world in tin reserves based on the Soviet system of reserve classification (Novikov and Yastrzhembskiy, 1999; Novikov and Sazonov, 2000). Russian ores, which are lower in grade than in other tin-producing countries, averaged 0.4% tin. Only the Khinganskiy deposit had higher grade ore that averaged 0.8% tin (Vorb'yev, 1999). Lode and placer deposits were mined in the eastern part of country. The tin content of ore on average is two to three times lower than that of foreign deposits under development (Novikov and Yastrzhembskiy, 1999; Vorob'yev, 1999). Unlike most countries of the world where tin was mined from placer deposits, Russia mined about 90% of its tin from lode deposits (Novikov and Sazonov, 2000).

Production Status.—In 1999, production of tin in concentrate increased by 5% mainly owing to a 36% increase in production at the Dalpolimet enterprise and a 12% increase in production at the Deputatskiy enterprise (Novikov and Sazonov, 2000). In 1999, Russia ranked eighth in the world in mine output of tin (U.S. Geological Survey, unpub. data, 1999).

Production Development.—Owing to the low quality of ore, the distant location of deposits, complex ore mining and processing conditions (all ore was extracted from underground mines), and other economic factors that included the sharp fall in domestic demand, mining had been sharply curtailed. Practically all mining enterprises had switched to extracting only rich ore (Novikov and Sazonov, 2000). Mining conditions were deteriorating at existing enterprises. Domestic tin demand had begun to exceed domestic tin production by one-third. To maintain production, plans called for developing mines at the Pravo-Urmiyskoye and the Sobolinskoye deposits and continuing construction of a processing plant at the Solnechnyy mining and beneficiation complex (Novikov and Yastrzhembskiy, 1999).

Titanium

Reserves.—Almost no domestic titanium raw materials was mined. The Ukrainian republic had supplied 93% of the Soviet Union's titanium raw materials, and Ukraine has continued to be the major ore supplier.

Production Status.—In 1999, Russia was estimated to be the world's second largest producer of titanium sponge (U.S. Geological Survey, unpub. data). Although Russia did not report titanium sponge production, it did report that production of rolled titanium increased by 37% in 1999 compared with that of 1998 (Interfax Mining and Metals Report, 2000g). In 1998, Russia reported that titanium sponge production was 22,000 t (Interfax Mining and Metals Report, 1999c). Still, titanium sponge production was about 40% below peak levels of the 1980's when large amounts were consumed by the Soviet defense industry. The largest markets for Russian titanium sponge had been the Verkhknaya Salda Metallurgical Production Association in Russia; the U.S. firms RMI Titanium

Company, Allegheny Teledyne Inc., Titanium Metals Corp., and Howmet Corp.; and European and Japanese firms (Interfax Mining and Metals Report, 1999d). The Russian titanium industry was supplying some of the world's leading aircraft manufacturers.

Production Development.—Plans called for mining titanium raw materials at the Tarskoye and the Tuganskoye deposits and for renovating the Berezniki titanium-magnesium plant which produced sponge (Kozlovskiy and Shchadov, 1999).

Tungsten

Reserves.—Tungsten reserves are geographically distributed as follows: North Caucasus, 46%; East Siberia, 29%; and Russian Far East, 24%. The tungsten trioxide content of reserves is on average 2.2 times lower than in deposits under development in other countries (Novikov and Yastrzhemskiy, 1999). The Tyrnyauz tungsten and molybdenum mining and processing complex in the Kabardino-Balkaria republic in the North Caucasus, which had been the country's largest tungsten producer, reportedly had proven commercial tungsten reserves of 374.1 Mt of ore in categories A+B+C₁; of which, 264.1 Mt was suitable for underground mining and 110 Mt was suitable for surface development. Despite its large reserves, the ore grades at Tyrnyauz were considerably lower than those at foreign operations (Levine, 1995).

The only deposits that could be claimed to contain high enough quality ore to be considered to be reserves from a market economy perspective were those under development at the Lermontov and the Primorye mining and beneficiation complexes, which had an average tungsten trioxide content of the ore that ranged from 1% to 2.2%. At the other tungsten mining enterprises, the average tungsten trioxide content of the ore ranged from 0.17% to 0.24% (Novikov and Sazonov, 2000).

Production Status.—Despite plummeting production since the dissolution of the Soviet Union, Russia was estimated to be the world's second largest mine producer of tungsten in 1999, (Shedd, 2000). Tungsten production had fallen by more than 50% since 1995 when world tungsten producers suffered a severe setback as Russia flooded the market with stockpiled material. This flooding of the market forced a number of Russian tungsten mines to close. The two major tungsten producers in the Russian Far East, the Lermontov and the Primorskiy mining and beneficiation complexes, were exporting 100% and 50%, respectively, of their concentrate production (Interfax Mining and Metals Report, 1999d).

Production Development.—Reserves were decreasing. In 10 to 15 years, reserves could be depleted at one-half of the tungsten mining enterprises. Production could be maintained by expanding capacity for mining tungsten ore at the Dzhida and the Tyrnyauz complexes and also by developing reserves at the Agylkinskoye deposit in the Yakut-Sakha republic, the Ktiteberdinskoye deposit in the North Caucasus, and a number of other small deposits with rich ore (Kozlovskiy and Shchadov, 1999).

Russia planned to increase tungsten production, with output projected to increase at the Lermontov and the Primorye mining and beneficiation complexes and at the Tyrnyauz tungsten and molybdenum mining complex (Interfax Mining and Metals Report, 1999d).

Uranium

Reserves.—According to data from the London Uranium Institute, explored uranium reserves in the FSU valued at \$80 per kilogram or less totaled 787,000 t; Russia possessed 127,000 t. This does not include Russia's large uranium stockpile, which, following the breakup of the Soviet Union, totaled between 200,000 and 250,000 t (Kozlovskiy and Shchadov, 1999).

Production Status.—Russia had only one uranium mining enterprise, the Priargunskiy, that mined the Streltsovskoye deposit and produced more than 2,500 t/yr of uranium in uranium concentrate (Krotkov, 2000). After 30 years of operation, the rich ores suitable for open pit mining had been depleted. Since 1992, the Priargunskiy enterprise had not shown profits. Besides mining uranium ore, Russia had been depending on stockpiled uranium, stores of which were depleting, and on reprocessing uranium raw materials and wastes, with some of the reprocessed uranium being produced in accordance with an international agreement with the United States. Russia had nine nuclear electric powerplants with an installed capacity of more than 21.2 million kilowatts (Mkw), which generated about 110 billion kilowatt hours of electricity or 13.5% of the country's total electricity generation (Lopatin, Kamnev, and Ivanov, 1999; Krotkov, 2000).

Production Development.—Plans called for Russia to increase nuclear powerplant capacity to 27.6 Mkw by 2001, which would increase the demand for uranium (Krotkov, 2000). The Russian Ministry of Atomic Energy had drawn up a plan that called for a reevaluation of reserves at the Streltsovskoye deposit to determine which portions of the reserves classified under the Soviet system were now economic, to bring in such new technology as in-situ leaching and heap leaching, to increase productivity at the Priargunskiy enterprise, and to introduce cost-cutting measures. Reprocessing uranium would not significantly provide for Russia's future demand, and Russia's uranium mineral-resource base was not adequate to provide for significant production increases. Plans called for exploring for new reserves, which, if discovered, would require large investments to develop (Lopatin, Kamnev, and Ivanov, 1999; Krotkov, 2000).

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TABLE 1
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 e/ |
|--|--------------|--------------|---------------|---------------|---------------|
| METALS | | | | | |
| Aluminium: | | | | | |
| Ore and concentrate: | | | | | |
| Alumina | 2,300,000 e/ | 2,105,000 | 2,400,000 | 2,465,000 | 2,657,000 3/ |
| Bauxite, 26% to 57% alumina e/ | 3,800,000 r/ | 3,800,000 r/ | 4,400,000 r/ | 4,500,000 r/ | 4,767,000 3/ |
| Nepheline concentrate, 25% to 30% e/ | 1,400,000 | 1,300,000 | 940,000 | 888,800 | NA |
| Metal, smelter, primary | 2,724,378 | 2,874,236 | 2,906,020 | 3,004,728 | 3,146,000 3/ |
| Antimony, mine output, Sb content (recoverable) e/ | 4,000 r/ | 5,000 r/ | 3,000 r/ | 1,950 r/ | 1,950 |
| Arsenic, white e/ | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Beryllium, beryl, cobbled, 10% to 20% BeO e/ 4/ | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Bismuth, mine output, Bi content e/ | 50 | 50 | 50 | 35 | 50 |
| Cadmium metal, smelter | 725 | 730 | 790 e/ | 800 e/ | 900 |
| Chromium, chrome ore, marketable | 151,400 | 96,700 | 150,000 e/ | 130,000 e/ | 100,000 |
| Cobalt: e/ | | | | | |
| Mine output, recoverable Co content | 3,500 | 3,300 | 3,300 | 3,200 | 3,300 |
| Metal, refined | 4,450 | 4,200 | 4,100 | 3,500 | 3,600 |
| Copper: | | | | | |
| Ore, Cu content, recoverable | 525,000 | 523,000 r/ | 505,000 e/ | 500,000 r/ | 530,000 |
| Metal: | | | | | |
| Blister: e/ | | | | | |
| Primary | 525,000 | 550,000 | 535,000 r/ | 510,000 r/ | 540,000 |
| Secondary | 20,000 | 20,000 | 35,000 r/ | 40,000 r/ | 36,000 |
| Refined: | | | | | |
| Primary | 504,000 | 543,000 r/ | 535,000 r/ | 543,000 r/ | 642,000 |
| Secondary | 56,000 | 57,000 | 65,000 r/ | 57,000 r/ | 57,000 |
| Total | 560,000 | 600,000 r/ | 600,000 r/ | 600,000 r/ | 699,000 |
| Gold, mine output, Au content kilograms | 131,900 r/ | 123,300 r/ | 124,000 r/ e/ | 114,900 r/ | 125,870 3/ |
| Iron and steel: | | | | | |
| Iron ore, 55% to 63% Fe | 75,900,000 | 69,600,000 | 70,800,000 e/ | 72,600,000 r/ | 82,200,000 3/ |
| Metal: | | | | | |
| Pig iron | 39,762,000 | 36,061,000 | 37,327,000 | 34,827,000 r/ | 40,033,000 3/ |
| Direct-reduced iron | 1,680,000 | 1,500,000 | 1,730,000 e/ | 1,550,000 | 1,880,000 3/ |
| Ferroalloys: e/ | | | | | |
| Blast furnace: | | | | | |
| Ferromanganese | 82,500 3/ | 67,000 3/ | 47,100 3/ | 45,000 3/ | 90,000 |
| Ferrophosphorus | -- 3/ | 2,300 3/ | 3,600 3/ | 3,500 | 3,500 |
| Spiegeleisen | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| Electric furnace: | | | | | |
| Ferrochromium | 290,000 | 135,000 | 247,000 | 203,000 3/ | 249,000 3/ |
| Ferrochromiumsilicon | 30,000 | 5,000 | 5,000 | 4,000 | 45,000 |
| Ferronickel | 77,000 3/ | 75,000 3/ | 40,000 | 30,000 | 30,000 |
| Ferrosilicon | 350,000 | 460,000 | 510,000 | 496,000 3/ | 601,000 3/ |
| Silicomanganese | 700 | -- | -- | -- | -- |
| Silicon metal | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |
| Other | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |
| Total | 917,000 | 831,000 | 940,000 | 869,000 | 1,110,000 |
| Steel: | | | | | |
| Crude | 51,300,000 | 49,193,000 | 48,499,300 | 43,821,800 | 51,500,000 3/ |
| Finished | 39,100,000 | 39,000,000 | 37,800,000 | 35,134,000 | 40,900,000 3/ |
| Pipe | 3,700,000 | 3,600,000 | 3,500,000 | 2,816,000 | 3,200,000 |
| Lead: | | | | | |
| Mine output, recoverable Pb content | 23,000 | 23,000 r/ | 16,000 r/ | 13,000 r/ | 13,000 |
| Metal, refined, primary and secondary e/ | 30,000 | 30,000 | 52,000 | 36,000 r/ | 30,000 |
| Magnesium: e/ | | | | | |
| Magnesite | 1,000,000 | 1,000,000 | 1,040,000 | 851,845 3/ | 900,000 |
| Metal, including secondary | 37,500 | 35,000 | 39,500 | 41,500 | 45,000 |
| Manganese, mine output, Mn content e/ | -- | 10,000 | 21,000 | 21,000 | 22,000 |
| Mercury e/ | 50 | 50 | 50 | 50 | 50 |
| Molybdenum e/ | 3,000 | 2,000 | 2,000 | 2,000 | 2,400 |
| Nickel: e/ | | | | | |
| Mine output, recoverable Ni content | 251,000 | 230,000 | 260,000 | 250,000 | 260,000 |
| Nickel products, including ferronickel | 201,100 | 190,000 | 230,000 | 227,000 r/ | 238,000 |

See footnotes at end of table.

TABLE 1--Continued
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 e/ |
|---|--------------|---------------|----------------|-------------------|----------------|
| METALS--Continued | | | | | |
| Platinum-group metals: e/ | | | | | |
| Platinum | 32,000 r/ | 35,000 r/ | 35,000 r/ | 35,000 r/ | 37,000 |
| Palladium | 85,000 r/ | 80,000 r/ | 80,000 r/ | 80,000 r/ | 85,000 |
| Other | 3,600 | 3,500 | 3,500 | 3,500 | 3,700 |
| Total | 121,000 r/ | 119,000 r/ | 119,000 r/ | 119,000 r/ | 126,000 |
| Silver e/ kilograms | 600,000 | 400,000 | 400,000 | 350,000 | 375,000 |
| Tin: e/ | | | | | |
| Mine output, recoverable Sn content | 9,000 | 8,000 | 7,500 | 4,300 r/ | 4,500 |
| Metal, smelter: | | | | | |
| Primary | 3,800 r/ | 3,200 r/ | 3,200 r/ | 2,400 r/ | 2,150 |
| Secondary | 700 r/ | 500 r/ | 500 r/ | 400 r/ | 400 |
| Total | 4,500 r/ | 3,700 r/ | 3,700 r/ | 2,800 r/ | 2,550 3/ |
| Titanium sponge e/ | 14,000 3/ | 20,000 | 21,000 | 22,000 | 24,000 |
| Tungsten concentrate, W content e/ | 5,400 | 3,000 | 3,000 | 3,000 | 3,500 |
| Vanadium metal | 11,000 | 11,000 | 9,000 | 9,000 e/ | 9,000 |
| Zinc: | | | | | |
| Mine output, recoverable Zn content | 131,000 | 126,000 | 121,000 e/ | 115,000 e/ | 132,000 |
| Metal, smelter, primary and secondary e/ | 166,000 | 172,000 | 189,000 | 192,000 r/ | 225,000 |
| INDUSTRIAL MINERALS | | | | | |
| Asbestos, grades I-VI e/ | 680,000 | 615,000 | 710,000 | 592,400 r/ 3/ | 674,400 3/ |
| Barite e/ | 70,000 | 70,000 | 60,000 | 60,000 | 60,000 |
| Cement, hydraulic | 36,500,000 | 27,800,000 | 26,600,000 | 26,726,000 | 28,400,000 |
| Clays: Kaolin including china clay | NA | NA | NA | 459,000 r/ | NA |
| Diamond: e/ | | | | | |
| Gem carats | 10,500,000 | 10,800,000 r/ | 11,200,000 r/ | 11,500,000 r/ | 11,500,000 |
| Industrial do. | 10,500,000 | 10,500,000 | 11,200,000 r/ | 11,500,000 r/ | 11,500,000 |
| Synthetic do. | 80,000,000 | 80,000,000 | 80,000,000 | 80,000,000 | 80,000,000 |
| Total do. | 101,000,000 | 101,000,000 | 102,000,000 r/ | 103,000,000 r/ | 103,000,000 |
| Diatomite | 50,000 | 50,000 | 50,000 | NA | NA |
| Feldspar e/ | 55,000 | 45,000 | 45,000 | 40,000 | 45,000 |
| Fluorspar, concentrate 55% to 96.4% CaF ₂ e/ | 250,000 | 250,000 | 250,000 | 220,000 r/ | 250,000 |
| Graphite e/ | 8,000 | 9,000 r/ | 10,000 r/ | 13,000 3/ | 13,000 |
| Gypsum | 697,000 | 1,534,000 | 559,000 | 609,400 r/ | 860,800 3/ |
| Lime, industrial and construction | 9,263,000 | 7,822,000 | 7,626,000 | 7,000,000 e/ | 7,000,000 |
| Lithium minerals, not further specified e/ | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Mica e/ | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Nitrogen, N content of ammonia | 7,900,000 | 7,900,000 | 7,150,000 | 6,500,000 e/ | 7,633,000 3/ |
| Phosphate rock: e/ | | | | | |
| Apatite concentrate, 37% to 39.6% P ₂ O ₅ | 3,100,000 r/ | 2,900,000 r/ | 3,200,000 r/ | 3,200,000 r/ | 3,550,000 |
| Sedimentary rock, 19% to 30% P ₂ O ₅ | 300,000 | 300,000 | 400,000 r/ | 535,000 r/ | 611,000 |
| Total | 3,400,000 r/ | 3,200,000 r/ | 3,600,000 r/ | 3,735,000 r/ | 4,161,000 |
| Potash, marketable, K ₂ O equivalent | 2,800,000 | 2,618,000 | 3,400,000 e/ | 3,500,000 e/ | 4,200,000 |
| Salt, all types | 3,100,000 | 2,100,000 | 2,100,000 | 2,000,000 e/ | 2,000,000 |
| Sodium compounds, n.e.s., carbonate | 1,823,000 | 1,500,000 | 1,700,000 | 1,600,000 e/ | NA |
| Sulfur: e/ | | | | | |
| Native | 80,000 | 70,000 | 50,000 | 50,000 | 50,000 |
| Pyrites | 450,000 | 400,000 | 400,000 | 400,000 | 400,000 |
| Byproduct, natural gas | 2,970,000 | 3,000,000 | 2,950,000 | 3,210,000 r/ | 3,680,000 |
| Other | 335,000 | 325,000 | 350,000 | 326,000 r/ | 325,000 |
| Total | 3,840,000 | 3,800,000 | 3,750,000 | 3,986,000 r/ 3/ | 4,455,000 3/ |
| Sulfuric acid | 6,946,000 | 5,650,000 e/ | 6,100,000 | 5,840,000 r/ | 7,125,000 3/ |
| Talc e/ | 100,000 | 100,000 | 90,000 | 79,000 3/ | 80,000 |
| Vermiculite e/ | 40,000 | 30,000 | 25,000 | 25,000 | 25,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Coal: e/ | | | | | |
| Anthracite | 19,700,000 | 19,100,000 | 18,300,000 | 15,000,000 r/ | 15,000,000 |
| Bituminous | 163,000,000 | 167,000,000 | 160,000,000 | 153,100,000 r/ 3/ | 165,700,000 3/ |
| Lignite | 98,000,000 | 90,000,000 | 83,000,000 | 78,800,000 r/ 3/ | 83,400,000 3/ |
| Total | 281,000,000 | 276,000,000 | 261,000,000 | 247,000,000 | 264,000,000 |
| Coke, 6% moisture content | 27,600,000 | 25,300,000 | 25,600,000 | 23,600,000 r/ | 28,100,000 |
| Gas, natural, marketed million cubic meters | 595,000 | 601,000 | 571,000 | 591,400 r/ | 591,000 |
| Oil shale | 2,300,000 | 2,000,000 e/ | 2,000,000 e/ | 1,715,000 r/ | 1,950,000 |

See footnotes at end of table.

TABLE 1--Continued
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 e/ |
|---|----------------|----------------|----------------|----------------|-------------|
| MINERAL FUELS AND RELATED MATERIALS--Continued | | | | | |
| Peat, fuel use | 4,400,000 | 4,100,000 | 3,300,000 | 1,767,000 r/ | 3,350,000 |
| Petroleum: | | | | | |
| Crude in: | | | | | |
| Gravimetric units | 307,000,000 r/ | 301,000,000 r/ | 306,000,000 r/ | 303,300,000 r/ | 305,000,000 |
| Volumetric units e/ thousand 42-gallon barrels | 2,260,000 r/ | 2,220,000 r/ | 2,250,000 r/ | 2,230,000 r/ | 2,240,000 |
| Refinery products 5/ | 183,000,000 | 183,000,000 | 178,000,000 | 163,676,000 | 169,000,000 |
| Uranium concentrate, U content | 2,250 | 2,000 | 2,000 | 2,000 | 1,750 |

e/ Estimated. r/ Revised. NA Not available. -- Zero.

1/ Table includes data available through November 2000.

2/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

3/ Reported figure.

4/ Russia may have stopped mining beryllium ore in the mid-1990's. No production of beryllium ore was reported in 1998.

5/ Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy and nonenergy products but exclude losses.

TABLE 2
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ |
|-------------------------------------|---------------------------------------|--|----------------------------------|
| Alumina | Achinsk | Achinsk in East Siberia | 900,000. |
| Do. | Bogoslovsk | Urals | 1,050,000. |
| Do. | Boksitogorsk | European north | 200,000. |
| Do. | Nadvoitsy | Nadvoitsy in Karelia | 266,000. |
| Do. | Uralsk | Kamensk region | 536,000. |
| Do. | Volkhov | Volkhov, east of St. Petersburg | 45,000. |
| Aluminum, primary | Smelters: | | |
| Do. | Volkhov | do. | 20,000. |
| Do. | Uralsk | Kamensk | 70,000. |
| Do. | Bogoslovsk | Krasnoturinsk | 162,000. |
| Do. | Novokuznetsk | Novokuznetsk | 284,000. |
| Do. | Kandalaksha | Kola Peninsula | 62,500. |
| Do. | Nadvoitsy | Nadvoitsy in Karelia | 68,000. |
| Do. | Volgograd | Volgograd | 168,000. |
| Do. | Irkutsk | Sherekov, near Irkutsk | 262,000. |
| Do. | Krasnoyarsk | Krasnoyarsk | 850,000. |
| Do. | Bratsk | Bratsk | 900,000. |
| Do. | Sayansk | Sayanogorsk | 400,000. |
| Antimony, Sb content of concentrate | Sarylakh deposit Sentachan deposit | Ust-Nera region Northeastern Yakut-Sakha republic | 6,000 (total for both deposits). |
| Antimony, metals and compounds | Ryaztvetmet plant | Ryazan | NA. |
| Apatite, concentrate | Khibiny apatit association | Kola Peninsula | 15,000,000. |
| Do. | Kovdor iron ore mining association | do. | 700,000. |
| Asbestos | Kiyembay | Orenburg Oblast | 500,000. |
| Do. | Tuvaasbest | Tuva Republic | 250,000. |
| Do. | Uralasbest | Central Urals | 1,100,000. |
| Bauxite | North-Urals mining company | Severouralsk region | NA. |
| Do. | South-Urals mining company | South Urals region | NA. |
| Do. | Severnaya Onega Mine | Northwest region | 800,000. |
| Boron | Bor Association | Maritime region | 140,000 (boric acid). |
| Do. | Amur River complex | Far East | 8,000 (boric acid). |
| Do. | Alga River chemical complex | do. | 12,000 (boric acid). |
| Chromite | Saranov complex | Saranov | 200,000. |
| Coal | Basins: | | |
| Do. | Donets (east) | Rostov Oblast | 30,000,000. |
| Do. | Kansk Achinsk | East Siberia | 50,000,000. |
| Do. | Kuznetsk | West Siberia | 160,000,000. |
| Do. | Moscow | Moscow region | 15,000,000. |
| Do. | Neryungri | Yakut-Sakha Republic | 15,000,000. |

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ |
|---|--|---------------------------------|--|
| Coal--Continued: | Basins--Continued: | | |
| Do. | Pechora | Komi Republic | 30,000,000. |
| Do. | South Yakutia | Yakut-Sakha Republic | 17,000,000. |
| Cobalt | Norilsk Nickel | Norilsk, Kola Peninsula | 4,000. |
| Do. | Rezh, Ufaleynikel | Southern Urals | 4,000 (total southern Urals). |
| Do. | Yuzhuralnikel enterprises | | |
| Do. | Tuva cobalt | Khovu-Aksy in Tuva Republic | NA. |
| Copper, mining and beneficiation complexes (Cu content of concentrates) | Buribai enterprise | Buribai region | 5,000. |
| Do. | Gai complex | Gai region | 40,000. |
| Do. | Kirovgrad complex | Kirovgrad region | 12,000. |
| Do. | Krasnouralsk complex | Krasnouralsk region | 12,000. |
| Do. | Norilsk complex | Norilsk region | 400,000. |
| Do. | Sredneuralsk complex | Ekatrinenburg region | 12,000. |
| Do. | Uchali complex | Uchali region | 40,000. |
| Do. | Urap complex | Stavropol region | 7,000. |
| Copper, metal (smelting and refining complexes) | Kirovgrad (smelting) | Kirovgrad | 150,000. |
| Do. | Krasnouralsk (smelting) | Krasnouralsk | 60,000. |
| Do. | Kyshtym (refining) | Kyshtym | 70000. |
| Do. | Mednogorsk (smelting) | Mednogorsk | 40,000. |
| Do. | Norilsk (smelting and refining) | Norilsk | 500,000. |
| Do. | Pyshma (refining) | Pyshma | 350,000. |
| Do. | Severonikel (smelting) | Monchegorsk | 20,000. |
| Do. | Sredneuralsk (smelting) | Revda | 140,000. |
| Diamonds | thousand carats | Almazy Rossii-Sakha Association | Aykhmal, Mirnyy, Udachnaya areas of Yakut-Sakha Republic |
| | | | 10,000 gem, 10,000 industrial. |
| Feldspar | Deposits: | | |
| Do. | Lupikko | Karelia | NA. |
| Do. | Kheto-Lanbino | do. | NA. |
| Ferroalloys | Kosaya Gora iron works | Kosaya Gora | 200,000. |
| Do. | Kuznetsk ferroalloy plant | Novokuznetsk | 400,000. |
| Do. | Lipetsk iron and steel works | Lipetsk | NA. |
| Do. | Serov ferroalloy plant | Serov | NA. |
| Do. | Tulachermet Scientific and Industrial Association | Tula | NA. |
| Do. | Chelyabinsk electrometallurgical plant | Chelyabinsk | 350,000. |
| Do. | Chusovoy iron and steel plant | Chusovoy | NA. |
| Do. | Klyuchevsk ferroalloy plant | Dvurechinsk | 160,000. |
| Fluorspar | Mining and beneficiation complexes: | | |
| Do. | Abagaytuy | trans-Baikal | NA. |
| Do. | Kalanguy | do. | NA. |
| Do. | Kyaktinsky | do. | NA. |
| Do. | Usugli | do. | NA. |
| Do. | Yaroslavsky | Far East | NA. |
| Gold | kilograms | Gold mining regions: | 200,000 (total gold). |
| Do. | do. | Yakut-Sakha | Yakut-Sakha Republic |
| Do. | do. | Buryat | Buryat Republic |
| Do. | do. | Magadan | Magadan Oblast |
| Do. | do. | Krasnoyarsk | Krasnoyarsk region |
| Do. | do. | Maritime | Maritime region |
| Do. | do. | Tuva | Tuva Republic |
| Iron ore | Mining areas: | | |
| Do. | Kursk Magnetic Anomaly (KMA) containing the following enterprises: | | 50,000,000 (total KMA). |
| Do. | Mikhailovka | Zheleznogorsk | |
| Do. | Lebedi | Gubkin | |
| Do. | Stoilo | do. | |
| Do. | Northwest containing the following enterprises: | | 22,000,000 (total Northwest). |
| Do. | Olenogorsk | Olenogorsk | |
| Do. | Kostomuksha | Kostomuksha | |
| Do. | Kovdor | Kola Peninsula | |

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ |
|---|---|---------------------------------------|--|
| Iron ore--Continued: | Mining areas--Continued: | | |
| Do. | Siberia (east) containing the following mining enterprises: | | 18,000,000 (total Siberia east and west). |
| Do. | Korshunovo | Zheleznogorsk | |
| Do. | Rudnogorsk | Rudnogorsk | |
| Do. | Siberia (west) including the following mining enterprises: | | |
| Do. | Abakan | Abaza | |
| Do. | Sheregesh | Sheregesh | |
| Do. | Tashtagol | Tashtagol | |
| Do. | Teya | Vershina Tei | |
| Do. | Urals containing the following mining enterprises: | | 22,000,000 (total Urals). |
| Do. | Akkermanovka | Novotroitsk | |
| Do. | Bakal | Bakal | |
| Do. | Goroblagodat | Kushva | |
| Do. | Kachkanar | Kachkanar | |
| Do. | Magnitogorsk | Magnitogorsk | |
| Do. | Peshchanka | Rudnichny | |
| Lead-zinc (recoverable metal content of ore) | Mining complexes: | | |
| Do. | Altay mining and beneficiation complex | Altay mountains region, South Siberia | 2,000 lead, 1,000 zinc. |
| Do. | Dalpolymetal mining and beneficiation complex | Maritime region | 20,000 lead, 25,000 zinc. |
| Do. | Nerchinsk polymetallic complex | Chita Oblast | 7,000 lead, 12,500 zinc. |
| Do. | Sadon lead-zinc complex | Severo-Osetiya | 5,000 lead, 14,000 zinc. |
| Do. | Salair mining and beneficiation complex | Kemerovo Oblast | 2,000 lead, 10,500 zinc. |
| Lead, metal | Dalpolymetal lead smelter | Rudnaya in the Maritime District | 20,000. |
| Do. | Elektrozinc lead smelter | Vladikavkaz in North Caucasus | 30,000. |
| Magnesite | Satka deposit | Chelyabinsk Oblast | 3,800,000. |
| Magnesium, metal (for sale) | Avisma plant | Berezniki | 22,000. |
| Do. | Solikamsk plant | Solikamsk | 21,500. |
| Mica | Mining complexes: | | |
| Do. | Aldan | Yakut-Sakha Republic | NA. |
| Do. | Karel | Karelia | NA. |
| Do. | Kovdor | Kola Peninsula | NA. |
| Do. | Mam | Irkutsk complex | NA. |
| Molybdenum, mining enterprise | Dzhida tungsten-molybdenum mine | West trans-Baikal | NA. |
| Do. | Sorsk molybdenum mining enterprise | Sorsk region | NA. |
| Do. | Tyrnyauz tungsten-molybdenum mining enterprise | North Caucasus | NA. |
| Do. | Shakhtaminskoye molybdenum mining enterprise | Chita Oblast | NA. |
| Natural gas | billion cubic meters | Regions: | |
| Do. | do. | Komi Republic | Komi Republic |
| Do. | do. | Norilsk area | Norilsk area |
| Do. | do. | North Caucasus | North Caucasus |
| Do. | do. | Sakhalin | Far East |
| Do. | do. | Tomsk Oblast | West Siberia |
| Do. | do. | Tyumen Oblast including: | do. |
| Do. | do. | Medvezhye field | do. |
| Do. | do. | Urengoi field | do. |
| Do. | do. | Vyrngapur field | do. |
| Do. | do. | Yamburg field | do. |
| Do. | do. | Urals | Urals |
| Do. | do. | Volga | Volga region |
| Do. | do. | Yakut-Sakha | Yakut-Sakha Republic |
| Nepheline syenite | Apatite complex | Kola Peninsula | 1,500,000. |
| Do. | Kiya-Shaltyr Mine | Goryachegorsk region, east Siberia | NA. |
| Nickel, mining enterprise (Ni in ore) | Norilsk Nickel Association | Norilsk region and Kola Peninsula | 300,000. |
| Do. | Yuzhuralnikel company | Southern Urals | 20,000 total southern Urals). |
| Do. | Ufaleynikel company | | |
| Nickel, metal (smelting and refining complexes) | Norilsk Nickel (smelting and refining) | Norilsk | 160,000 (smelting), 100,000 (refining). |
| Do. | do. | Pechenga | 50,000 (smelting). |

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ Annual capacity e/ |
|---|--|-------------------------------------|--|
| Nickel, metal (smelting and refining complexes)--Continued: | Norilsk Nickel (smelting and refining) | Monchegorsk | 50,000 (smelting), 140,000 (refining). |
| Do. | Rezh, Ufaleynikel, Yuzhuralnikel enterprises | Southern Urals | 65,000 (total, nickel products and nickel in ferronickel). |
| Oil shale | Leningradslanets Association | Slantsy region | 5,000,000. |
| Petroleum | Producing regions: | | |
| Do. | European Russia: | | |
| Do. | Astrakhan | Northern Caspian Sea Basin | 700,000. |
| Do. | Bashkortostan | Urals | 28,000,000. |
| Do. | Checheno-Ingush Republic | Southern Caucasus | 4,500,000. |
| Do. | Dagestan | North Caucasus | 700,000. |
| Do. | Kaliningrad Oblast | Baltic coast | 1,800,000. |
| Do. | Komi Republic | Northwest | 15,000,000. |
| Do. | Krasnodar Krai | North Caucasus | 2,000,000. |
| Do. | Orenburg Oblast | Urals | 13,000,000. |
| Do. | Perm Oblast | do. | 12,000,000. |
| Do. | Samara | Volga region | 16,000,000. |
| Do. | Saratov Oblast | do. | 1,500,000. |
| Do. | Stavropol Krai | North Caucasus | 2,000,000. |
| Do. | Tatarstan | Volga region | 40,000,000. |
| Do. | Udmurt Republic | Urals | 9,000,000. |
| Do. | East Siberia: Tomsk Oblast | Tomsk Oblast | 11,000,000. |
| Do. | West Siberia: | | |
| Do. | Tyumen Oblast: | Tyumen Oblast | 300,000,000. |
| Do. | Kogolym field | do. | 34,000,000. |
| Do. | Krasnoleninskiy field | do. | 12,000,000. |
| Do. | Langepas field | do. | 30,000,000. |
| Do. | Megion field | do. | 18,000,000. |
| Do. | Nizhnevartovsk field | do. | 70,000,000. |
| Do. | Noyabrsk field | do. | 37,000,000. |
| Do. | Purneftegaz field | do. | 12,000,000. |
| Do. | Surgut field | do. | 48,000,000. |
| Do. | Uray field | do. | 8,000,000. |
| Do. | Varegan field | do. | 10,000,000. |
| Do. | Sakhalin Island | Sakhalin Island | 2,500,000. |
| Phosphate rock | Khibiny Apatit Association | Kola Peninsula | 20,000,000 (apatite concentrate). |
| Do. | Kovdor iron ore mining complex | do. | 700,000 (apatite concentrate). |
| Do. | Kingisepp complex | Leningrad Oblast | NA. |
| Do. | Lopatino, Yegorevsk deposits | Moscow Oblast | NA. |
| Do. | Polpinskoye deposit | Bryansk Oblast | NA. |
| Do. | Verkhnekamsk deposit | Urals | NA. |
| Platinum-group metals: | | | 130 (total metal). |
| Ore | Norilsk Nickel Association | Norilsk region | |
| Metals | Krasnoyarsk refinery | Krasnoyarsk | NA. |
| Potash, K ₂ O | Uralkaliy | Verkhne Kamsk deposit | 3,000,000. |
| Do. | Silvinit | Solikamsk-Berezniki region of Urals | 2,000,000. |
| Silver | Dukat Mine | Magadan Oblast | 1,000 (total silver). |
| | Coproduct and byproduct of gold and nonferrous metals mining | | |
| Soda ash | Achinsk plant | East Siberia | 595. |
| Do. | Berezniki plant | Urals | 1,080. |
| Do. | Pikalevo plant | Leningrad Oblast | 200. |
| Do. | Sterlitamak plant | Sterlitamak | 2,135. |
| Do. | Volkhov plant | Leningrad Oblast | 20. |
| Steel, crude | Amurstal | Komsomolsk na Amur | 1,600,000. |
| Do. | Asha | Asha | 450,000. |
| Do. | Beloretsk | Bashkir Republic | 380,000. |
| Do. | Severstal (Cherepovets) | Cherepovets | 14,000,000. |
| Do. | Chusovoy | Chusovoy | 570,000. |
| Do. | Elektrostal | Moscow | 314,000. |

See footnotes at end of table.

TABLE 2--Continued
 RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ |
|--|---|----------------------------------|-----------------------|
| Steel, crude--Continued: | Gorky | Nizhniy-Novgorod | 78,000. |
| Do. | Guryevsk | Guryevsk | 160,000. |
| Do. | Karaganda | Karaganda | 6,300,000. |
| Do. | Kuznetsk | Novokuznetsk | 4,700,000. |
| Do. | Lipetsk | Lipetsk | 9,900,000. |
| Do. | Lysva | Lysva | 350,000. |
| Do. | Magnitogorsk | Magnitogorsk | 16,200,000. |
| Do. | Mechel (Chelyabinsk) | Chelyabinsk | 7,000,000. |
| Do. | Nizhniy Tagil | Nizhniy Tagil | 8,000,000. |
| Do. | Nizhniy Sergi | Nizhniy Sergi | 300,000. |
| Do. | Nosta (Orsk-Khalilovo) | Novotroitsk in Orenburg Oblast | 4,600,000. |
| Do. | Novosibirsk | Novosibirsk | 1,100,000. |
| Do. | Omutninsk | Omutninsk | 210,000. |
| Do. | Oskol Electric Steel | Stary Oskol | 1,450,000. |
| Do. | Petrovsk-Zabaikalskiy | Petrovsk-Zabaikalskiy | 426,000. |
| Do. | Revda | Revda | 281,000. |
| Do. | Salda | Sverdlovsk Oblast | 1,900. |
| Do. | Serov A.K. | Serov | 1,000,000. |
| Do. | Serp i Molot | Moscow | 70,000. |
| Do. | Severskiy | Polevskoy in Sverdlovsk Oblast | 825,000. |
| Do. | Sibelektrostal | Krasnoyarsk | 110,000. |
| Do. | Sulin | Sulin | 280,000. |
| Do. | Taganrog | Taganrog | 925,000. |
| Do. | Tulachermet-Scientific and Industrial Association | Tula | 18,400. |
| Do. | Verkh-Issetskiy | Ekatrinenburg | 132,000. |
| Do. | Volgograd | Volgograd | 2,000,000. |
| Do. | Vyksa | Vyksa | 540,000. |
| Do. | West Siberian | Novokuznetsk | 6,900,000. |
| Do. | Zlatoust | Zlatoust in Chelyabinsk Oblast | 1,200,000. |
| Talc | Deposits: | | |
| Do. | Onotsk | Irkutsk Oblast | NA. |
| Do. | Kirgiteysk | Krasnoyarsk Krai | NA. |
| Do. | Miass | Chelyabinsk Oblast | NA. |
| Do. | Shabrovska | Sverdlovsk Oblast | NA. |
| Tin, mining and beneficiation complexes | Khingan | Khabarovsk Krai | NA. |
| Do. | Solnechnyy | do. | NA. |
| Do. | Iultin | Magadan Oblast | NA. |
| Do. | Khrustal'nyy | Maritime region | NA. |
| Do. | Deputatskiy | Yakut-Sakha Republic | NA. |
| Do. | Pevek | Magadan Oblast | NA. |
| Tin, smelters | Novosibirsk | Novosibirsk | NA. |
| Do. | Podolsk | Podolsk | NA. |
| Do. | Ryazan | Ryazan | NA. |
| Titanium, metal | Berezniki plant | Berezniki | 40,000. |
| Do. | Moscow plant | Moscow | NA. |
| Do. | Podolsk plant | Podolsk | NA. |
| Tungsten, mining and beneficiation complexes (W content of concentrates) | Antonovogorsk | East Transbaikal | NA. |
| Do. | Balkan | Urals, northeast of Magnitogorsk | NA. |
| Do. | Belukha | East trans-Baikal | NA. |
| Do. | Bom-Gorkhom | West trans-Baikal | NA. |
| Do. | Dzhida | do. | NA. |
| Do. | Iultin | Magadan Oblast | NA. |
| Do. | Lermontov | Maritime region | NA. |
| Do. | Solnechnyy | Southern Khabarovsk region | NA. |
| Do. | Tyrnyauz | North Caucasus | NA. |
| Do. | Primorye | Maritime region | NA. |
| Tungsten, metal | Nalchik plant | Caucasus | NA. |
| Uranium, U content | Priargunskiy mining and chemical enterprise | Krasnokamensk | 3,000. |
| Vanadium, ore | Kachkanar iron ore mining complex | Urals | NA. |
| Vanadium, metallurgical processing facilities | Chusovoy plant | do. | 17,000 (total metal). |
| | Nizhniy Tagil plant | | |

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Metric tons unless otherwise specified)

| Commodity | Major operating facilities | Location | Annual capacity e/ |
|--|---|-------------------------------|--------------------|
| Zinc (nonassociated with lead), metal content of ore | Bashkir copper-zinc complex | Sibai in southern Urals | 5,000. |
| Do. | Buribai copper-zinc mining complex | Buribai in southern Urals | 1,500. |
| Do. | Gai copper-zinc mining and beneficiation complex | Gai in Southern Urals | 25,000. |
| Do. | Kirovgrad copper enterprise | Kirovgrad in central Urals | 1,200. |
| Do. | Sredneuralsk copper complex | Revda in central Urals | 5,000. |
| Do. | Uchali copper-zinc mining and beneficiation complex | Uchali in southern Urals | 90,000. |
| Zinc, metal | Chelyabinsk electrolytic zinc plant | Chelyabinsk | 190,000. |
| Do. | Elektrozink plant | Vladikavkaz in North Caucasus | 100,000. |

e/ Estimated. NA Not available.

TABLE 3
SELECT RUSSIAN EXPORTS

(Thousand metric tons)

| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 |
|------------------------------|---------|---------|---------|---------|---------|
| Aluminum, primary: | 2,250 | 2,619 | 2,710 | 2,795 | 3,122 |
| To non-CIS countries | 2,253 | 2,617 | 2,707 | 2,790 | 3,114 |
| To CIS countries | 4 | 2 | 3 | 5 | 9 |
| Coal, hard: | 30,360 | 26,259 | 23,093 | 23,478 | 27,700 |
| To non-CIS countries | 21,243 | 20,866 | 19,703 | 18,224 | 22,000 |
| To CIS countries | 9,117 | 5,393 | 3,390 | 5,254 | 5,700 |
| Copper, refined: | 471 | 530 | 535 | 551 | 635 |
| To non-CIS countries | 467 | 527 | 534 | 550 | 633 |
| To CIS countries | 4 | 2 | 1 | 1 | 2 |
| Ferroalloys: | 497 | 286 | 343 | 336 | 410 |
| To non-CIS countries | 479 | 274 | 334 | 322 | 392 |
| To CIS countries | 18 | 11 | 9 | 13 | 19 |
| Iron ore and concentrates: | 13,834 | 11,257 | 11,773 | 13,828 | 10,841 |
| To non-CIS countries | 11,370 | 7,891 | 8,393 | 10,145 | 7,637 |
| To CIS countries | 2,514 | 3,366 | 3,380 | 3,683 | 3,204 |
| Natural gas, Mm3: | 192,193 | 198,514 | 200,858 | 200,618 | 205,100 |
| To non-CIS countries | 121,882 | 128,028 | 120,871 | 125,044 | 131,100 |
| To CIS countries | 70,311 | 70,486 | 79,987 | 75,574 | 74,300 |
| Nickel: | 153 | 167 | 222 | 214 | 211 |
| To non-CIS countries | 153 | 167 | 222 | 214 | 211 |
| To CIS countries | -- | -- | -- | -- | -- |
| Petroleum, crude: | 122,336 | 125,953 | 126,847 | 137,108 | 134,600 |
| To non-CIS countries | 96,209 | 105,377 | 109,755 | 117,934 | 115,800 |
| To CIS countries | 26,127 | 20,576 | 17,094 | 19,174 | 18,800 |
| Petroleum refinery products: | 47,075 | 57,006 | 61,308 | 53,797 | 50,800 |
| To non-CIS countries | 96,209 | 54,876 | 59,102 | 51,187 | 47,800 |
| To CIS countries | 3,528 | 1,606 | 2,206 | 2,610 | 3,000 |
| Pig iron: | 2,888 | 2,109 | 2,455 | 2,540 | 2,908 |
| To non-CIS countries | 2,830 | 2,043 | 2,397 | 2,451 | 2,775 |
| To CIS countries | 59 | 66 | 58 | 89 | 133 |

-- Zero.